

10/031,445

AMENDMENT TO THE CLAIMS

1. (Currently Amended) A bipolar transistor, comprising:
- a first semiconductor layer to be a collector layer formed on a substrate and including an impurity of a first conductive type;
 - a second semiconductor layer to be a base layer formed on said first semiconductor layer and including an impurity of a second conductive type;
 - a third semiconductor layer formed on said second semiconductor layer from a material having a bandgap different from a bandgap of said second semiconductor layer;
 - an insulator film provided on said third semiconductor layer;
 - an opening portion formed through said insulator film to reach said third semiconductor layer; and
 - an emitter connecting electrode made of a conductor material and brought into contact with said third semiconductor layer by filling said opening portion in said insulator film,
- wherein said third semiconductor layer includes an emitter diffusion layer of the first conductive type positioned below said opening portion, and a peripheral layer located at a lateral side of said emitter diffusion layer and below said insulator film, and
- said peripheral layer includes the impurity of the second conductive type so as to be distributed at a high concentration in an upper part, at a low concentration at the center and at a high concentration in a lower part within the peripheral layer.

2. (Original) The bipolar transistor according to claim 1, wherein:

10/031,445

said insulator film is formed from a silicon dioxide film doped with the impurity of the second conductive type; and

the impurity of the second conductive type included in at least a part of the top portion of said third semiconductor layer is the impurity of the second conductive type out-diffused from said insulator film.

3. (Previously presented) The bipolar transistor according to claim 1, further comprising:

a polysilicon film, doped with the impurity of the second conductive type and provided so as to contact said third semiconductor layer at a portion located outside of said insulator film and to extend over said insulator film, for functioning as a base connecting electrode,

wherein the impurity of the second conductive type included in at least a part of the top portion of said third semiconductor layer is the impurity of the second conductive type out-diffused from said polysilicon film by passing through said insulator film.

4. (Previously presented) The bipolar transistor according to claim 1, wherein the impurity of the first conductive type in the emitter diffusion layer of said third semiconductor layer is the impurity of the first conductive type out-diffused from said emitter connecting electrode.

5. (Previously presented) The bipolar transistor according to claim 1, wherein:

said substrate is a silicon substrate;

said first semiconductor layer is a Si layer;

10/031,445

said second semiconductor layer is a SiGe layer or a SiGeC layer; and

said third semiconductor layer is a Si layer.

6. (Withdrawn) A fabrication method of a bipolar transistor, comprising:

a step (a) of forming a second semiconductor layer to be a base layer including a second conductive type impurity on a first semiconductor layer that is formed on a substrate to be a collector layer including a first conductive type impurity;

a step (b) of forming, on said second semiconductor layer, a third semiconductor layer, including the second conductive type impurity at least at an upper part thereof, through epitaxial growth from a material having a bandgap different from a bandgap of said second semiconductor layer;

a step (c) of depositing an insulator film on said substrate after said step (b);

a step (d) of forming an opening portion through said insulator film to reach said third semiconductor layer; and

a step (e) of forming an emitter diffusion layer in said third semiconductor layer at a region positioned below said opening portion by introducing the first conductive type impurity.

7. (Withdrawn) A fabrication method of a bipolar transistor, comprising:

a step (a) of forming a second semiconductor layer to be a base layer including a second conductive type impurity on a first semiconductor layer that is formed on a substrate to be a collector layer including a first conductive type impurity;

10/031,445

a step (b) of forming, on said second semiconductor layer, a third semiconductor layer through epitaxial growth from a material having a bandgap different from a bandgap of said second semiconductor layer;

a step (c) of depositing an insulator film including the second conductive type impurity on said substrate after said step (b);

a step (d) of forming an opening portion through said insulator film to reach said third semiconductor layer; and

a step (e) of forming an emitter diffusion layer in said third semiconductor layer at a region positioned below said opening portion by introducing the first conductive type impurity,

wherein the second conductive type impurity is doped into a top portion of said third semiconductor layer from said insulator film by treatments after said step (c).

8. (Withdrawn) A fabrication method of a bipolar transistor, comprising:

a step (a) of forming a second semiconductor layer to be a base layer including a second conductive type impurity on a first semiconductor layer that is formed on a substrate to be a collector layer including a first conductive type impurity;

a step (b) of forming, on said second semiconductor layer, a third semiconductor layer through epitaxial growth from a material having a bandgap different from a bandgap of said second semiconductor layer;

a step (c) of depositing an insulator film on said substrate after said step (b);

a step (d) of depositing a conductor film including the second conductive type impurity on said substrate and forming an opening portion through said conductor film to reach said insulator film;

10/031,445

a step (e) of forming a sidewall made of an insulating material for covering a side surface of the opening portion in said first conductor film;

a step (f) of forming an opening portion through said insulator film to reach said third semiconductor layer after said step (e); and

a step (g) of forming an emitter diffusion layer in said third semiconductor layer at a region located below the opening portion by introducing the first conductive type impurity,

wherein the second conductive type impurity is doped into an upper part of said third semiconductor layer from said conductor film by passing through said insulator film by treatments after said step (d).

9. (Withdrawn) The fabrication method of a bipolar transistor according to claim 8, further comprising:

a step of depositing, on said substrate, another conductor film different from said conductor film, and then patterning said another conductor film to form an emitter connecting electrode including the first conductive type impurity in such a manner so as to fill in the opening portion in said insulator film and to extend over said insulator film, said step following said step (f) and preceding said step (g).